Standard Indicators
Science 8.7.3

Simulated Flotation

Purpose

Students will use technology to assist in graphing and with simulations that compute and display results of changing factors in models.

Materials

For each student: copy of Black Line Master (BLM) *To Float or Not to Float*, pencil, paper
For each group of students: computer with access to the Internet, printer, spreadsheet program

Activity

A. Pre-Activity Preparation

Visit the Web site www.explorescience.com/activities/index.cfm, allow the Shockwave Plugin to install if necessary, and ensure that the simulation runs properly on each computer.

B. Density Simulation

1. Ask students to describe how they would measure an object's mass.
2. Ask students how they would measure an object's volume.
3. Explain to students that one can calculate volume by measuring an object's dimensions with a ruler, but one can also determine an object's volume by observing how much water it displaces when it is put into a volume of water.
4. Have students brainstorm factors that might affect whether an object will float or not.
5. Tell students they will be using a simulation to experiment with whether a variety of objects will float or sink.
6. Divide students into small groups, pass out the BLM *To Float or Not to Float*, and direct students to computers.
7. Direct students to go to the Web site www.explorescience.com/activities/index.cfm, choose "Mechanics," scroll down and choose the Density Lab simulation.
8. Instruct students to begin the simulation and follow the instructions to complete the table on the BLM.
9. Ensure that students correctly prepare and print their graphs.

C. Discussion

1. When students have completed the BLM, bring the class back together.
2. Have a student sketch his/her graph on the board, indicating which point corresponds to which shape.

Technology Literacy Standards

	I	II	III	IV	V	VI	VII
1	X						X
2		X					X
3				X			X
4							X
5				X			X
6				X			
7							
8							
9							
10							
11				X			
12				X			
13							
14							
15							
16							

[X] = This Technology Literacy Standard is addressed in this lesson.

[ ] = This Technology Literacy Standard is not addressed in this lesson.

3. As students view the graph, ask the following questions:
- Did everyone's graph look the same? Why or why not?
- Do you notice any relationship between the densities of objects that float or objects that sink? [Objects with a density less than that of the liquid will float. Objects with a density greater than that of the liquid will sink.]
- How does the graph help you visually represent the relationship between density and whether an object floats or not? [Densities less than 1 g/ml (the density of water) fall below the line while densities greater than 1 g/ml fall above the line. The graph helps us visually determine which objects will float and which will sink in a liquid with a density of 1 g/ml.]

4. Have students discuss their graphs and what could have caused any differences they may have.
5. Discuss students' experiences using the simulation. Ask students: "What did the simulation enable us to do that completing the experiment ourselves would not enable us to do easily or at all?"
6. Ask students if they thought they might have been able to do anything better if they had performed the experiment themselves.
7. Ask students if they enjoyed using the spreadsheet and/or found it helpful. Ask students: "How did using a spreadsheet make completing our experiment easier? More difficult?"
8. Review the concept of density and what students discovered through the use of the simulation and spreadsheet program.

Classroom Assessment

Basic Concepts and Processes

As students work through the simulation and during class discussion, ask questions such as the following:


What relationship between density and floating can you see from the data?


How did changing the density of the liquid affect the objects in it?


How did you create the graph?

Name: _____

TO FLOAT OR NOT TO FLOAT

Instructions:

1. Open the following Web site: www.explorescience.com/activities/index.cfm.

2. Click the *Mechanics* section and then scroll down and click *Density Lab*.

3. Use the simulator to take the mass of each shape and determine its volume (an object's volume is equal to the amount of water it displaces when placed in the graduated cylinder).

4. Do ***not*** place the shape in the pail of liquid.

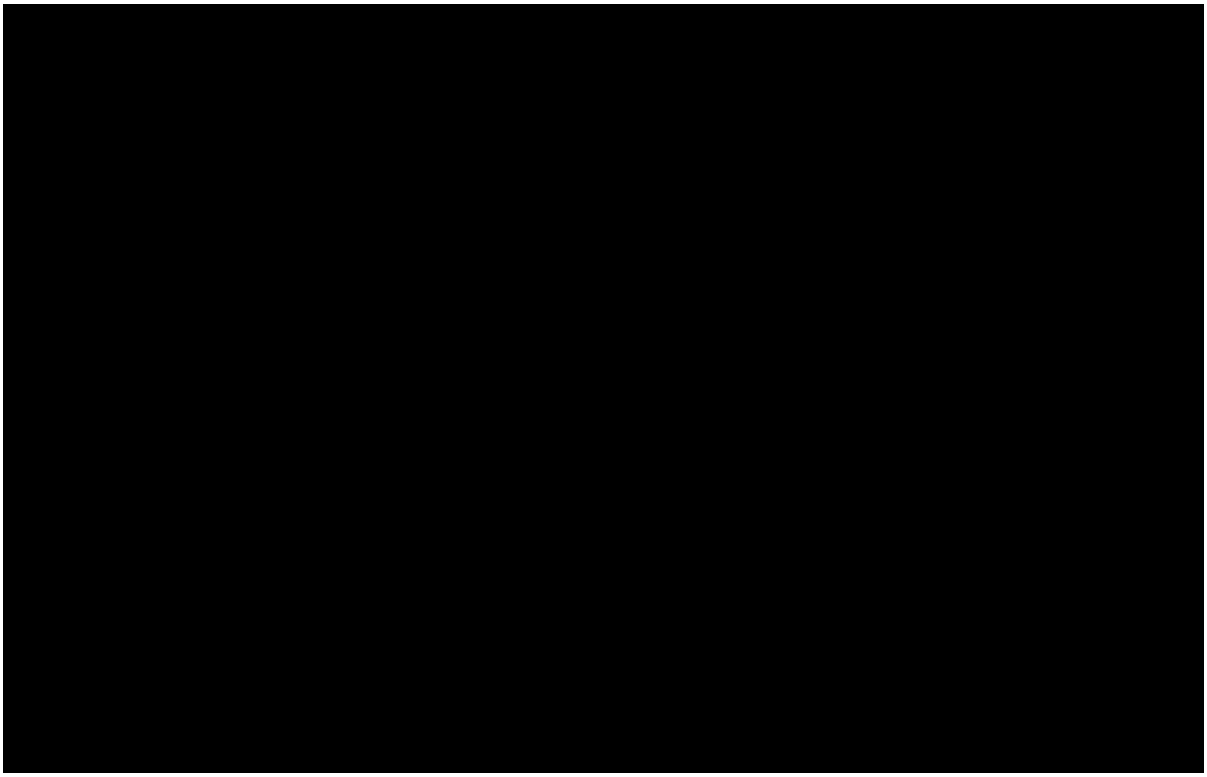
5. Record your results in the appropriate columns below.

6. Calculate the density of each object by dividing the object's mass by its volume.

7. Determine whether each object floats in water (density 1 g/ml) by fixing the density of the *Pail of Liquid* to 1 g/cc (1 ml = 1 cc) and dropping each object in the liquid.

8. Pick two different densities of liquid to test and record them in the table below.

9. Determine if the objects float in liquids of either of the two additional densities.



10. Use a spreadsheet program to create an X-Y scatter plot with Volume on the *x*-axis and Mass on the *y*-axis. Do not draw a line through your data points.

11. Add a second set of data that shows a density of 1 for various masses [e.g., (1,1) 25,25) (50,50) and (100,100)]. Draw a line through this set to use as a visual reference.

To Float or Not to Float

Teacher Directions

Distribute the BLM *To Float or Not to Float* to students. Provide students with computers that have Internet access and a spreadsheet program. Assist students in entering their data, producing their graphs, and printing their results.

Answer Key

Answers for the last two columns will vary with the densities chosen; however, students should accurately record that any object with a density greater than that of the liquid will sink.